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IS 6637 (1972): Methods for determination of moisture in wool [TXD 1: Physical Methods of Tests]

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IS : 6637 - 1972

*Indian Standard*  
METHODS FOR  
DETERMINATION OF MOISTURE IN WOOL

UDC 677·31:677·014·332 [543·812]



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INDIAN STANDARDS INSTITUTION  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 1

November 1972

**AMENDMENT NO. 1 MARCH 2000**  
**TO**  
**IS 6637 : 1972 METHODS FOR DETERMINATION**  
**OF MOISTURE IN WOOL**

( *Cover page, pages 1 and 3, Title* ) — Substitute ‘METHOD’ for ‘METHODS’.

( *Page 3, clause 0.3* ) — Delete the clause and renumber subsequent clauses.

[ *Page 3, clause 0.4 ( renumbered 0.3 )* ] — Delete the following:

‘ASTM Designation : D 2462-69 Method of test for moisture in wool by distillation with toluene’.

( *Page 3, clause 1.1* ) — Substitute ‘a method’ for ‘two methods’.

( *Page 4, clause 1.2* ) — Substitute the following for the existing:

‘1.2 This standard is applicable to wool in all forms, namely, scoured wool, carded wool, garnetted wool, wool top, wool raving etc, except that it is not applicable to greasy wool.’

( *Page 4, clause 4* ) — Delete the clause and renumber subsequent clauses.

[ *Page 7, clause 5 ( renumbered 4 )* ] — Substitute ‘OVEN DRYING METHOD’ for ‘METHOD II’.

( *Page 8, clause 6.1* ) — Delete item (b) and renumber subsequent entries.

( TX 01 )

# Indian Standard

## METHODS FOR DETERMINATION OF MOISTURE IN WOOL

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# *Indian Standard*

## METHODS FOR DETERMINATION OF MOISTURE IN WOOL

### 0. F O R E W O R D

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 7 July 1972, after the draft finalized by the Physical Methods of Test Sectional Committee had been approved by the Textile Division Council.

**0.2** Wool is a highly hygroscopic fibre and absorbs different amount of moisture under different atmospheric conditions. The amount of moisture present in the material is important especially at the time of making sales or purchases and during process.

**0.3** This standard covers two methods. Method I is relatively time consuming and costly and is, therefore, recommended for accurate determinations only. Method II is a simple and convenient method for routine process control, in-plant evaluation, estimation of moisture content of a lot and for any other purpose for which a high degree of reproducibility is not necessary. Method I is not suitable for wool containing steam-distillable or water-soluble matter.

**0.4** In the preparation of this standard, assistance has been derived from the following standards issued by the American Society for Testing and Materials:

ASTM Designation : D 1576-64 Method of test for moisture in wool by oven-drying

ASTM Designation : D 2462-69 Method of test for moisture in wool by distillation with toluene

**0.5** In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS:2-1960\*.

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### 1. SCOPE

**1.1** This standard prescribes two methods for determination of moisture in wool.

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\*Rules for rounding off numerical values (*revised*).

**1.2** This standard is applicable to wool in all forms, namely, greasy wool, scoured wool, carded wool, garnetted wool, wool top, wool roving, etc, except that Method I is not applicable to wool containing steam-distillable or water-soluble matter and Method II is not applicable to greasy wool.

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply (*see also IS : 232-1967\**).

**2.1 Moisture Content** — The amount of moisture in wool expressed as a percentage of the total mass.

*Example:*

If 100 parts by mass of wool contains 20 parts by mass of moisture, the moisture content is

$$\frac{100 \times 20}{100} = 20 \text{ percent}$$

**2.2 Moisture Regain** — The amount of moisture in wool expressed as a percentage of the oven-dry mass.

*Example*

If 100 parts by mass of wool contains 20 parts by mass of moisture, the regain is

$$\frac{100 \times 20}{80} = 25 \text{ percent}$$

## 3. SAMPLING

**3.1** Samples shall be drawn as prescribed in the material specification or as agreed to between the parties concerned.

**3.1.1** Care shall be taken to prevent gain or loss of moisture during the sampling operation and in the transfer of material to the sample containers.

## 4. METHOD I

**4.0 Outline of the Method** — A sample of wool is weighed, conditioned in the standard atmospheric conditions and weighed again. A test specimen from the conditioned sample is weighed and distilled with water-saturated toluene. The amount of water extracted is measured and taken as moisture in the specimen. The calculations are made for moisture content and moisture regain on this basis, taking also into consideration the change in the mass of sample on conditioning.

### 4.1 Apparatus

**4.1.1 Erlenmeyer Flask** — having wide mouth and 1000 ml capacity.

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\*Glossary of textile terms—Natural fibres (*first revision*).

**4.1.2 Distilling Receiver** — of 10 ml capacity.

**4.1.3 Condenser**

**4.1.4 Balance** — capable of weighing to an accuracy of 50 mg.

**4.1.5 Heater**

**4.1.6 Water-Bath**

**4.1.7 Sample Containers** — polyethylene bags or airtight jars.

## 4.2 Reagents

**4.2.1 Toluene** — purified, water-saturated, having a boiling range such that all distills within a range of 2°C including 110·6°C.

**4.2.1.1 Preparation** — Add 50 to 100 ml of distilled water to each litre of toluene. Shake for about 5 minutes and allow it to settle. Decant the toluene in to a flask and attach a reflux condenser with a calibrated water trap. Reflux for 1 hour or until no water comes to the trap. Take this as water-saturated toluene ready for use.

**4.2.2 Potassium Dichromate (for Cleaning)** — Mix 35 ml of saturated potassium dichromate solution with 1 litre of concentrated sulphuric acid.

**4.3 Atmospheric Conditions for Conditioning and Testing** — The test sample shall be conditioned in the standard atmosphere at  $65 \pm 2$  percent relative humidity and  $27 \pm 2^\circ\text{C}$  temperature as laid down in IS : 6359-1971\*.

## 4.4 Procedure

**4.4.1** Prior to use, clean the receiver and the condenser with potassium dichromate. Rinse thoroughly with water, then with methyl alcohol and dry (*see Note*).

**NOTE** — The cleaning operation is not required for subsequent observations.

**4.4.2** Set up a distilling apparatus for control purposes and add 700 ml of water-saturated toluene to the distilling flask. Add exactly 5·0 ml of distilled water from a burette or a pipette. Distil the toluene as given in **4.4.7** and **4.4.8** and measure the volume of water collected in the trap. If the volume of water is not within the range of 4·95 to 5·05 ml, treat the toluene again as given in **4.2.1.1**.

**4.4.3** Draw a test sample as given in **3.1** and put it immediately in the sampling container and seal it. Determine the mass of the container with sample and find out the net mass ( $M_1$ ) by deducting the tare from the total mass.

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\*Method for conditioning of textiles.

**4.4.4** Condition the sample as in **4.3** and determine its mass ( $M_2$ ).

**4.4.5** Take one test specimen from the conditioned sample, weighing about 50 to 70 g, and determine its mass ( $M_3$ ) correct to 50 mg.

**4.4.6** Transfer the test specimen immediately to the distilling flask and add 700 ml of toluene. Connect the flask, receiver and condenser and place the flask on the heater. Start the flow of cooling water through the condenser. Add more toluene through the top of the condenser until the receiver trap is full of toluene and it begins to flow to the flask.

**4.4.7** Heat the toluene to boiling point and adjust the rate of distillation to 2 drops per second. When the rate of water accumulation becomes less than 0.1 ml per 15 minutes, increase the rate of distillation to 4 drops per second. Wash down the condenser by pouring toluene through the top of the condenser. Dislodge any visible drops of water with the help of a nylon brush saturated with toluene or with the help of a copper wire.

**4.4.8** Continue distillation until there is no noticeable change in the level of meniscus for a period of 15 minutes. Separate the receiver containing water and toluene from the flask and condenser. Keep the receiver in the water-bath at room temperature for about 30 minutes and read the volume of water ( $V$ ) correct to 0.05 ml.

**4.4.9** Similarly test at least 6 more test specimens.

#### 4.5 Calculations

**4.5.1** Calculate the moisture content and moisture regain by the following formulæ:

$$\text{a) Moisture content, percent} = \left[ \frac{M_2}{M_1} \left( \frac{V}{M_3} - 1 \right) + 1 \right] \times 100$$

$$\text{b) Moisture regain, percent} = \left[ \frac{M_1}{M_2 \left( 1 - \frac{V}{M_3} \right)} - 1 \right] \times 100$$

where

$M_2$  = conditioned mass in g of the sample (see **4.4.3**),

$M_1$  = original mass in g of the sample (see **4.4.3**),

$V$  = volume in ml of the water collected (see **4.4.8**), and

NOTE — For calculation purpose, 1 ml of water = 1 g.

$M_3$  = mass in g of the specimen taken (see **4.4.5**).

**4.5.2** Calculate the average moisture content and average moisture regain of all the test specimens correct to one place of decimal.

**4.5.3** For interconversion of moisture regain and moisture content values, the following equations may be used:

$$\text{a) } R = \frac{C}{100 - C} \times 100$$

$$\text{b) } C = \frac{R}{100 + R} \times 100$$

where

$R$  = moisture regain, and

$C$  = moisture content.

## 5. METHOD II

**5.0 Outline of the Method** — A specimen of wool is weighed and then dried to constant mass in an oven at 105°C. The loss in mass of the specimen is taken as the loss of moisture and then calculations are made for moisture regain and moisture content on this basis.

### 5.1 Apparatus

**5.1.1 Drying Oven** — preferably of ventilated type, capable of maintaining an inside temperature of 105 to 110°C and preferably fitted with weighing balance capable of weighing to an accuracy of 50 mg.

**5.1.2 Specimen Containers** — of perforated metal if the weighing is to be carried out inside the drying oven, or capable of being sealed if the specimen is to be cooled in a desiccator before weighing.

**5.1.3 Sample Containers** — polyethylene bags or airtight jars.

**5.1.4 Balance** — capable of weighing to an accuracy of 1 mg.

### 5.2 Procedure

**5.2.1** Draw a test specimen (*see Note*) as given in 3.1, put it immediately in the sample container and seal it. Determine the mass of the container with specimen and find out the net mass of the specimen ( $M_1$ ) by deducting the tare from the total mass.

**Note** — Take a specimen weighing about 250 g if the drying oven is fitted with a weighing balance, and about 10 g if the oven-dry mass is to be determined outside after cooling in a desiccator.

**5.2.2** Put the specimen in a suitable container and dry it to constant mass (*see Note*) in the drying oven.

**Note** — The constant mass shall be deemed to have been reached when two successive weighings made at an interval of 20 minutes do not differ by more than 0.05 percent.

**5.2.3** Determine the oven-dry mass of the specimen ( $M_1$ ) without removing it from the oven with the air flow stopped. In case the drying oven is not provided with the weighing balance, remove the specimen from the oven and transfer it to a weighing container of known mass and close the lid. The transference of the specimen should be done in as little a time as possible. Cool the specimen and the container in a desiccator to room temperature and weigh. Find out the dry mass ( $M_2$ ) of the specimen.

**5.2.4** Test at least 3 test specimens if the drying oven is fitted with a weighing balance, otherwise test at least 5 test specimens.

### **5.3 Calculations**

**5.3.1** Calculate the moisture content and moisture regain by the following formulae:

$$\text{a) Moisture content, percent} = \frac{M_1 - M_2}{M_1} \times 100$$

$$\text{b) Moisture regain, percent} = \frac{M_1 - M_2}{M_2} \times 100$$

where

$M_1$  = original mass of the specimen, and

$M_2$  = oven-dry mass of the specimen.

**5.3.2** Calculate the average moisture content and average moisture regain of all the test specimens correct to one place of decimal.

**5.3.3** For interconversion of moisture regain and moisture content values, the equations given in **4.5.3** may be used.

## **6. REPORT**

**6.1** The report shall include the following information:

- a) Type of material;
- b) Method followed;
- c) Number of specimens tested;
- d) Moisture regain, percent; and
- e) Moisture content, percent.

## **INDIAN STANDARDS**

**ON**

### **PHYSICAL METHODS OF TEST FOR WOOL TEXTILES**

**IS:**

681-1964 Methods for determination of universal count of woollen and worsted yarn  
744-1966 Method for determination of wool fibre diameter-projection microscope method (*first revision*)  
832-1964 Method for determination of twist in yarn  
1348-1971 Method for determination of kemp content of raw wool (*first revision*)  
1377-1971 Method for determination of mean fibre length of wool (*first revision*)  
1670-1970 Method for determination of breaking load, elongation at break and tenacity of yarns (*first revision*)  
1671-1960 Method for determination of skein breaking load (strength), tenacity and yarn strength index of cotton yarn (by constant-rate-of-traverse machine) (metric system)  
1954-1969 Methods for determination of length and width of fabrics (*first revision*)  
1963-1969 Methods for determination of threads per decimetre in woven fabrics (*first revision*)  
1964-1970 Methods for determination of weight per square metre and weight per linear metre of fabrics (*first revision*)  
1966-1961 Methods for determination of bursting strength of woven and knitted fabrics  
1969-1968 Method for determination of breaking load and elongation at break of woven textile fabrics (*first revision*)  
2702-1965 Method for determination of thermal resistance of textile fabrics-guarded hot-plate method  
2899-1965 Method for determination of percentage of medullated fibres in wool  
4681-1968 Method for determination of wrinkle recovery of fabrics (by measuring crease recovery angle)  
4902-1968 Method for determination of correct invoice weight and moisture content of woollen and worsted yarns  
6124-1971 Method for determination of crimp in wool

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